NERL/IO Publications

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Presented Published

ABSTRCT/ORAL

Graham, J.A., and Mauderly, J.J. Airborne particulate matter: physico-chemical characteristics and human exposure issues related to health effects research and assessment. Presented at: Society of Toxicology Meeting, Philadelphia, PA, March 19-23, 2000. — 3/19/2000

Contact: Judith A. Graham

Abstract: Exposure to particulate matter (PM) is associated with excess mortality and morbidity, especially in individuals with cardiopulmonary disease. These epidemiologic findings are the cornerstone of EPA's revision of the PM National Ambient Quality Standards to include PM less than 2.5 microns. Uncertainties in the available information caused the US Congress to stimulate research by having the National Academy of Sciences identify key information needs and by significantly increasing research budgets. Of the several areas of research needed, the ones on mechanisms of the effect(s) and characterization of the causal PM (and perhaps co-occurring gases) are crucial. Key hypothesis for causative factors are: mass, size, number, surface area, chemistry, co-occurring gases, or some combination of them. Many toxicologists are engaging in research on these topics. One major difficulty is understanding the complex nature of PM as a prelude to designing the most effective studies. This workshop is designed to provide toxicologists with background on the nature of PM and exposures. Both aspects are important. Knowing the physico-chemical nature of key classes of PM is basic. For example, there are major differences between ultrafine, fine, and coarse mode particles in addition to size. Biological components might also have important influences. Information on co-occurring gasses is also a major element. Even if the ambient air were perfectly understood, it still is essential to characterize what fractions people are exposed to. This is an abstract of proposed presentation and does not necessarily reflect the views of EPA or LRRI.

Foley, G.J. Using models to develop air toxics reduction strategies: Lake Michigan as a test case. Presented at: Lake Michigan Forum, Milwaukee, WI, November 8-9, 2000. — 11/8/2000

Contact: Gary J. Foley

Abstract:

BOOK

Cox, L.H. "Statistical Disclosure Limitation." In: Encyclopedia of Statistical Sciences, Update, Samuel Kotz, Campbell B. Read, and David L. Banks (Ed.), John Wiley and Sons, Inc., 1999, 693-697. — 2/1/2000

Contact: Lawrence H. Cox

Abstract:

JOURNAL

Linthurst, R.A., Mulkey, L.A., Slimak, M.E., Veith, G.D., and Levinson, B.M. Ecological research in the Office of Research and Development U.S. EPA: an overview of new directions. Environmental Toxicology and Chemistry (Pensacola, FL: Society of Environmental Toxicology and Chemistry Press) Vol. 19, No. 4 (2):1222-1229 (2000). EPA/600/J-00/104. 4/3/2000

Contact: Rick A. Linthurst

Abstract: In virtually every major environmental act, Congress has required that the U.S. Environmental Protection Agency (U.S. EPA) ensure not only that the air be safe to breathe, the water safe to drink, and the food supply free of contamination, but also that the environment be protected. In response, the U.S. EPA's Office of research and Development (ORD) has established research to improve ecosystem risk assessment and management, identifying it as one of the highest priority research areas for investment over the next 10 years. The research is intended to provide environmental managers with new tools and flexible guidance that reflect a holistic environmental management perspective of science and that can be applied both to common and unique problems. In keeping with its responsibility to provide the U.S. EPA with science that supports a dynamic changing regulatory agenda, the ORD has set the goal of its Ecological Research Program to "provide the scientific understanding required to measure, model, maintain and/or restore, at multiple scales, the integrity and sustainability of ecosystem now, and in the future". In the context of this program, ecological integrity is defined in relative terms as the maintenance of ecosystem structure and function characteristic of a reference condition deemed appropriate for its use by society, and sustainability is defined as the ability of an ecosystem to maintain relative ecological integrity into the future. Therefore, the research program will emphasize relative risk and consider the impact of multiple stressors, at multiple scales and at multiple levels of biological organization. The program will also shift from chemical to biological and physical stressors to a far greater extent than in the past. The purpose of this paper is to provide an introduction to the U.S.EPA's changing ecological research program.

Cox, L.H. Combining evidence on air pollution and daily mortality from 20 largest U.S. cities: a hierarchical modeling strategy. Journal of the Royal Statistical Society (Oxford, United Kingdom: Blackwell Publishers) 163 (3):294-295 (2000). 12/31/2000

Contact: Lawrence H. Cox

Abstract: Environmental science and management are fed by individual studies of pollution effects, often focused on single locations. Data are encountered data, typically from multiple sources and on different time and spatial scales. Statistical issues including publication bias and multiple comparisons are often present but unaddressed. Policy makers must pool individual studies to infer and understand pollution-health effects relationships and trends and act upon them. Inference and pooling cannot rely on traditional design-based methods or meta-analytic techniques, and model-based, hierarchical, Bayesian methods are needed. The authors have contributed to environmental epidemiology and environmetrics by providing a general hierarchal methodology for pooling estimates of pollution health effects, demonstrated for the important case of particulate mortality effects. Contributions of this work are to enable scientific investigation on a regional or national scale, and to borrow strength between multiple studies, some of which may be too small (in observations) or too coarse (in frequency) to provide reliable estimates at all locations. Potential advantages are to enable critical examination of the problem at single locations, e.g., to assess bias or to explore additional covariates. The latter is particularly important for particulate matter health effects, as questions remain regarding the relative mortality effects of size, chemical composition, shape and number of particles. Effects of multiple pollutants are also important, including fine (2.5 microns or less) and coarse (2.5-10 microns) particles. Some observations: The examination of bias introduced by measurement error is important and was raised in a National Research Council report on setting research priorities for particulate matter studies (National Academy of Sciences 1998). The authors selected a two-stage, not fully Bayesian, model. Pooled meteorological adjustments might capture otherwise ignored regional effects and improve estimates of local relative mortality effects. Some regional effects are captured by the spatial analysis, based on distance. Direction may also be influential; geometric anisotropy (Cressie, 1994, p. 64) could be incorporated into the spatial model. A fully Bayesian approach enables assessing uncertainty due to model selection (Clyde 1998). Despite evidence of negligible difference between the two approaches for these data, a general methodology for national surveillance of effects of air pollution and weather on public health would likely benefit from a fully Bayesian approach. The authors did not set out to compare U.S. national air quality standards for particulate matter with epidemiological evidence of particulate matter health effects, but observe that estimated relative effects obtain above and below the regulatory standard. A more meaningful regulatory comparison would be based on maximum daily concentration. Views expressed are solely those of the author and should not be interpreted as representing the policies or practices of the U.S. Environmental Protection Agency.

Presented Published

Cox, L.H. Statistical issues in the study of air pollution involving airborne particulate matter. Environmetrics (Sussex, England: John Wiley and Sons Ltd.) 11 (6):611-626 (2000). 11/1/2000

Contact: Lawrence H. Cox

Abstract: Epidemiological research in the early 1990s focusing on health effects of airborne particulate matter pointed to a statistical association between increases in concentration of particulate in ambient air and increases in daily nonaccidental mortality, particularly among the elderly. These results appear consistent across a range of U.S. cities. This and other scientific and policy information formed the basis on which the U.S. Environmental Protection Agency (USEPA) promulgated revised, stricter air quality standards for particulate matter in 1997. Prior to implementing revised particulate matter standards, USEPA will complete (in 2002) a second National Ambient Air Quality Standards (NAAQS) review based on new science and policy information. Much of the science information involves use of statistics or is based on statistical models. Research priorities associated with setting regulatory standards for particulate matter were provided by the Committee on Research Priorities for Airborne Particulate Matter of the National Research Council. One of the Committee's ten research topics dealt with statistical issues. This paper reports conclusions and recommendations from a 1998 interdisciplinary Workshop on Particulate Methodology organized by the National Research Center on Statistics and the Environment and the the USEPA. The purpose of the Workshop as to set a statistical research agenda relevant to setting air quality standards for ambient particulate matter pollution, timed to coincide with the current NAAQS review.

SYMPOS/CONF

McDonald, J.F., Cohen, M.D., Meyer, D.M., and Mathewson, L.M. Estimating the transfer and deposition of dioxin and atrzine to the Great Lakes Basin with the NOAA HYSPLIT Model - an overview. Presented at: AWMA 93rd Annual Conference and Exhibition, Salt Lake City, UT, June 18-22, 2000. EPA/600/A-00/033 (NTIS PB2000-107428). 6/18/2000

Contact: Debra M. Meyer

Abstract: Over the last few years, the International Joint Commission has been supporting development of a PC-based transfer model, derived from the HYSPLIT model created at the National Oceanic and Atmospheric Administration (NOAA), to determine, in a cost-effective way, the extent of deposition of selected persistent toxic substances to the Great Lakes from US and Canadian sources and source regions. Outputs for dioxin and atrazine will be described, quantifying the percentage of emissions of these substances from specific point and county level sources which will be deposited in Lake Superior. The impact of specific sources and source categories will be considered. The authors believe this technology will prove useful as a tool in developing a strategy for further control of these sources.

Foley, G.J., and McKay, D.C. Atmospheric mercury science programs being undertaken in North America. Presented at: Conference on Air Quality II Mercury, Trace Elements, and Particulate Matter, McLean, Virginia, September 19-21, 2000. EPA/600/A-00/107 (NTIS PB2001-101545). 9/19/2000

Contact: Gary J. Foley

Abstract: National and international concern about the health effects and continued use of mercury (Hg) as well as other metals has defined the need for estimates of the long term risks to ecosystems and human health from Hg released from human activities. The atmosphere is one of the mechanisms by which Hg is transported throughout the environment. This presentation will provide an overview of what efforts are being undertaken within the U.S. and Canada to improve our understanding of the processes governing the atmospheric concentrations of mercury, the temporal and spatial variability of atmospheric mercury, and the sources and sinks of atmospheric mercury.

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Presented Published

Cox, L.H. Towards a bayesian perspective on statistical disclosure limitation. Presented at: Sixth World Meeting of the International Society for Bayesian Analysis 2000, Hersonissos Heraklion-Crete, Greece, May 28-June 1, 2000. EPA/600/A-00/082 (NTIS PB2001-100155). 5/28/2000

Contact: Lawrence H. Cox

Abstract: National statistical offices and other organizations collect data on individual subjects (person, businesses, organizations), typically while assuring the subject that data pertaining to them will be held confidential. These data provide the raw material for statistical data products (tabular summaries, microdata files comprising data records pertaining to individual subjects, and, potentially, public statistical data bases and statistical query systems) which the statistical office disseminates to multiple, broad user communities. Statistical disclosure limitation (SDL) refers to the problem and methods for thwarting reidentification of a subject and divulging the subject's confidential data through analysis or manipulation of disseminated data products. SDL methods abbreviate or modify the data product sufficiently to thwart disclosure. SDL problems are typically computationally demanding; several have been shown to be NP-hard. Many SDL methods draw upon statistical, mathematical or optimization theory, but at the same time heuristic and partial approaches abound. Contributions from a Bayesian perspective have been few but are increasing. A strong theoretical connection between definitions of statistical disclosure, measurement of disclosure risk, and evaluation of SDL methods is lacking. This suggests opportunities for Bayesian and hierarchical approaches. Selected opportunities and associated SDL methodological issues are discussed.

Cox, L.H. Discussion. Presented at: Second International Conference on Establishment Surveys, Buffalo, NY, June 17-22, 2000. EPA/600/A-00/008. 6/1/2000

Contact: Lawrence H. Cox

Abstract: This is an invited discussion of three invited papers on statistical disclosure limitation from the Second International Conference on Establishment Surveys, Buffalo, NY, June 2000. The three papers in this session deal with computing, estimates, and computing estimates in the context of statistical disclosure limitation.